

What is claimed is:

1. A pad conditioning system for conditioning a polishing pad in conjunction with a workpiece polishing operation, the pad conditioning system comprising:

5 a pad conditioning head having a plurality of abrasive particles protruding from a surface of the pad conditioning head;

a positioning unit coupled with the pad conditioning head, wherein the positioning unit is configured to move the surface into contact with a polishing pad; and

10 a liquid supply nozzle configured to selectively discharge liquid onto the abrasive particles that are in contact with the polishing pad to minimize frictional wear of the abrasive particles.

2. The pad conditioning system of claim 1, wherein the pad conditioning head includes an aperture formed in the surface that is positionable contiguous with the polishing pad, the liquid supply nozzle disposed in the aperture.

20 3. The pad conditioning system of claim 1, further comprising a manifold mounted on the pad conditioning head adjacent to the surface, the manifold comprising the liquid supply nozzle.

4. The pad conditioning system of claim 1, further comprising a liquid supply line that extends through the pad conditioning head and is configured to supply liquid to the liquid supply nozzle.

25 5. The pad conditioning system of claim 1, wherein the pad conditioning head comprises a conditioning element that is substantially disc shaped and the surface is formed on the conditioning element.

30 6. The pad conditioning system of claim 5, wherein the surface is a flat surface.

7. The pad conditioning system of claim 5, wherein the surface is a domed surface.

5 8. The pad conditioning system of claim 1, wherein the positioning unit is configured to move the pad conditioning head into contact with the polishing pad with sufficient down force to roughen the polishing pad.

10 9. The pad conditioning system of claim 1, wherein the abrasive particles comprise diamonds and the liquid is water.

15 10. The pad conditioning system of claim 1, wherein the positioning unit is configured to maintain contact between the pad conditioning head and the polishing pad and selectively move the pad conditioning head in a predetermined pattern on the surface of the polishing pad.

20 11. The pad conditioning system of claim 1, wherein the liquid supply nozzle is configured to discharge liquid between the polishing pad and the surface of the pad conditioning head.

25 12. A pad conditioning system for conditioning a polishing pad in conjunction with a workpiece polishing operation, the pad conditioning system comprising:

a liquid supply nozzle configured to discharge liquid in a predetermined area; and

25 a pad conditioning head positionable proximate to the liquid supply nozzle, the pad conditioning head comprising a conditioning element upon which a plurality of abrasive particles are disposed,

30 wherein the conditioning element is configured to be pressed into and moved in a determined pattern around a surface of a polishing pad to roughen the surface of the polishing pad with the abrasive particles,

wherein the liquid supply nozzle is configured to discharge liquid between the conditioning element and the polishing pad.

13. The pad conditioning system of claim 12, wherein the liquid supply nozzle is coupled at the periphery of the conditioning element.

5 14. The pad conditioning system of claim 12, wherein the conditioning element includes an aperture formed on the conditioning element between the abrasive particles, the liquid supply nozzle disposed in the aperture.

10 15. The pad conditioning system of claim 14, wherein the liquid supply nozzle is a plurality of liquid supply nozzles and the aperture is a plurality of apertures distributed around the abrasive particles, and each of the liquid supply nozzles is disposed in one of the apertures so that liquid may be selectively discharged from the liquid supply nozzles to minimize wear of the abrasive particles.

15 16. The pad conditioning system of claim 12, wherein the conditioning element is configured to rotate while being pressed into the polishing pad, and the pad conditioning head includes a rotary union coupled with a liquid supply line and the liquid supply nozzle so that the liquid supply nozzle is rotatable with the conditioning element.

20 17. The pad conditioning system of claim 12, wherein a surface of the conditioning element that includes the abrasive particles is flat.

25 18. The pad conditioning system of claim 12, wherein a surface of the conditioning element that includes the abrasive particles is domed.

30 19. The pad conditioning system of claim 12, wherein the flow rate of liquid discharged by the liquid supply nozzle is configurable to lubricate, cool and remove residue from the polishing pad without adverse affect on a liquid slurry present on the polishing pad.

20. The pad conditioning system of claim 12, wherein the liquid supply nozzle is in a manifold, and the pad conditioning head comprises a mounting plate upon which the conditioning element is mounted, the manifold mounted on the mounting plate.

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21. The pad conditioning system of claim 12, further comprising a liquid supply line coupled with the liquid supply nozzle, wherein the conditioning element is configured to gimbal and the liquid supply line includes a gimbal coupling to relieve stress on the liquid supply line when the conditioning element gimbals.

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22. A method of conditioning a polishing pad in conjunction with a workpiece polishing operation, the method comprising:

applying a slurry to a polishing pad;

pressing a surface of a pad conditioning head into the polishing pad to condition the polishing pad, wherein the surface includes a plurality of abrasive particles extending outward from the surface;

repositioning the pad conditioning head in various locations on the polishing pad;

pressing a work piece into the polishing pad to polish the workpiece with the slurry; and

selectively discharging liquid between the abrasive particles and the polishing pad only in the area being conditioned.

25. The method of claim 22, wherein selectively discharging liquid comprises minimizing the residue developed when the polishing pad is conditioned.

24. The method of claim 22, wherein selectively discharging liquid comprises minimizing the heat developed when the polishing pad is conditioned.

30. The method of claim 22, wherein selectively discharging liquid comprises discharging liquid from an aperture formed in the surface of the pad conditioning head.

26. The method of claim 22, wherein selectively discharging liquid comprises discharging liquid from a liquid supply nozzle coupled at a peripheral edge of the surface of the pad conditioning head.

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27. The method of claim 22, wherein selectively discharging liquid comprises directing residue on the polishing pad away from the path of the workpiece being polished, wherein the residue is being directed with the discharged liquid.

10 28. The method of claim 22, wherein selectively discharging liquid comprises rinsing residue away from the abrasive particles, wherein the residue is being rinsed away with the discharged liquid.

15 29. The method of claim 22, wherein repositioning the pad conditioning head comprises moving the pad conditioning head in consideration of the areas on the conditioning pad that are being used to polish a workpiece.

20 30. The method of claim 22, wherein the surface of the pad conditioning head comprises a conditioning element and pressing a surface of a pad conditioning head into the polishing pad comprises gimbaling the conditioning element to maintain the surface substantially parallel with the polishing pad.

25 31. The method of claim 22, wherein selectively discharging liquid comprises discharging liquid near the center of the surface of the pad conditioning head.